

What is claimed is:

1. An image display device comprising:

a display panel which is to be viewed from N number of view points and includes a plurality of display pixels

5 arranged in a matrix, each display pixel having MXN (M and N each represent a natural number) number of sub-pixels, said MXN number of sub-pixels included in each of said display pixels being formed within a square area; and

a lenticular lens for distributing light rays from

10 said sub-pixels individually to said view points.

2. The image display device according to claim 1,

wherein said display panel is a monochrome display panel and M represents 1, and wherein when assuming a pitch of said sub-pixels arranged in a longitudinal direction along a

15 ridge projection of said lenticular lens is a and a pitch of said sub-pixels arranged in a direction orthogonal to said longitudinal direction of said lenticular lens is b, an expression a : b = N : 1 results.

3. The image display device according to claim 1,

20 wherein said display panel is a color display panel comprising sub-pixels of three primary colors and M represents 3, and wherein when assuming a pitch of said sub-pixels arranged in a longitudinal direction along a ridge projection of said lenticular lens is a and a pitch of said 25 sub-pixels arranged in a direction orthogonal to said longitudinal direction of said lenticular lens is b, an expression a : b = 3XN : 1 results.

4. The image display device according to claim 1,

wherein said display panel is a color display panel comprising sub-pixels of three primary colors and M represents 3, and wherein when assuming a pitch of said sub-pixels arranged in a longitudinal direction along a ridge 5 projection of said lenticular lens is a and a pitch of said sub-pixels arranged in a direction orthogonal to said longitudinal direction of said lenticular lens is b, an expression a : b = N : 3 results.

5. The image display device according to claim 4, 10 wherein said primary color sub-pixels having the same color are arranged in a direction orthogonal to said longitudinal direction of said lenticular lens.

6. The image display device according to claim 4, wherein said primary color sub-pixels having the same color 15 are arranged in a direction orthogonal to said longitudinal direction of said lenticular lens.

7. An image display device comprising:  
a display panel which is to be viewed from N number of view points and includes a plurality of display pixels, each 20 including N (N represents a natural number) number of sub-pixels; and

a lenticular lens,  
said image display device being further constructed such that when assuming a pitch of a lens array in said 25 lenticular lens is L, a pitch of said sub-pixels of said display pixel is P, a pitch of said sub-pixels arranged in a longitudinal direction along a ridge projection of said lenticular lens is a, and a pitch of said sub-pixels

arranged in a direction orthogonal to said longitudinal direction of said lenticular lens is b, said pitches satisfy the following expression.

$$\underline{a} : \underline{b} = L : P$$

5 8. An image display device comprising:

a display panel which is to be viewed from N number of view points and includes a plurality of display pixels, each including  $3 \times N$  (N represents a natural number) number of primary color sub-pixels; and

10 a lenticular lens,

said image display device being further constructed such that when assuming a pitch of a lens array in said lenticular lens is L, a pitch of said sub-pixels of said display pixel is P, a pitch of said sub-pixels arranged in a

15 longitudinal direction along a ridge projection of said lenticular lens is a, and a pitch of said sub-pixels arranged in a direction orthogonal to said longitudinal direction of said lenticular lens is b, said pitches satisfy the following expression.

20  $\underline{a} : \underline{b} = 3 \times L : P$

9. An image display device comprising:

a display panel which is to be viewed from N number of view points and includes a plurality of display pixels, each including  $3 \times N$  (N represents a natural number) number of primary color sub-pixels; and

25 a lenticular lens,

said image display device being further constructed such that when assuming a pitch of a lens array in said

lenticular lens is  $L$ , a pitch of said sub-pixels of said display pixel is  $P$ , a pitch of sub-pixels arranged in a longitudinal direction along a ridge projection of said lenticular lens is  $a$ , and a pitch of said sub-pixels arranged in a direction orthogonal to said longitudinal direction of said lenticular lens is  $b$ , said pitches satisfy the following expression.

$$a : b = L/3 : P$$

10. The image display device according to claim 7, wherein said primary color sub-pixels having the same color are arranged in a direction orthogonal to said longitudinal direction of said lenticular lens.

11. The image display device according to claim 7, wherein a set of three sub-pixels having the same relative 15 positional relationship to a central axis of said lenticular lens and positioned adjacent one another constitutes primary color sub-pixels with primary colors, red, blue and green.

12. The image display device according to claim 1, wherein a focal distance of said lenticular lens and a 20 distance between an apex of said lens and said pixel are different from each other.

13. The image display device according to claim 7, wherein a focal distance of said lenticular lens and a 25 distance between an apex of said lens and said pixel are different from each other.

14. The image display device according to claim 8, wherein a focal distance of said lenticular lens and a distance between an apex of said lens and said pixel are

different from each other.

15. The image display device according to claim 9,  
wherein a focal distance of said lenticular lens and a  
distance between an apex of said lens and said pixel are  
5 different from each other.

16. The image display device according to claim 1,  
wherein said longitudinal direction along said ridge  
projection of said lenticular lens is a horizontal direction  
of an image to be displayed.

10 17. The image display device according to claim 7,  
wherein said longitudinal direction along said ridge  
projection of said lenticular lens is a horizontal direction  
of an image to be displayed.

15 18. The image display device according to claim 8,  
wherein said longitudinal direction along said ridge  
projection of said lenticular lens is a horizontal direction  
of an image to be displayed.

19. The image display device according to claim 9,  
wherein said longitudinal direction along said ridge  
20 projection of said lenticular lens is a horizontal direction  
of an image to be displayed.

20. An image display device comprising:

a display panel which is to be viewed from N number of  
view points and includes a plurality of display pixels  
25 arranged in a matrix, each display pixel having  $M \times N$  ( $M$  and  
 $N$  each represent a natural number) number of sub-pixels,  
said  $M \times N$  number of sub-pixels included in each of said  
display pixels being formed within a square area; and

a parallax barrier for distributing light rays from said sub-pixels individually to said view points.

21. The image display device according to claim 20, wherein said display panel is a monochrome display panel and 5 M represents 1, and wherein when assuming a pitch of said sub-pixels arranged in a longitudinal direction of a slit opening of said parallax barrier is a and a pitch of said sub-pixels arranged in a direction orthogonal to said longitudinal direction of said slit opening is b, said 10 pitches satisfy the following expression.

$$\underline{a} : \underline{b} = N : 1$$

22. The image display device according to claim 20, wherein said display panel is a color display panel comprising sub-pixels of three primary colors and M 15 represents 3, and wherein when assuming a pitch of sub-pixels arranged in a longitudinal direction of a slit opening of said parallax barrier is a and a pitch of said sub-pixels arranged in a direction orthogonal to said longitudinal direction of said slit opening is b, said 20 pitches satisfy the following expression.

$$\underline{a} : \underline{b} = 3 \times N : 1$$

23. The image display device according to claim 20, wherein said display panel is a color display panel comprising sub-pixels of three primary colors and M 25 represents 3, and wherein when assuming a pitch of said sub-pixels arranged in a longitudinal direction of a slit opening of said parallax barrier is a and a pitch of said sub-pixels arranged in a direction orthogonal to said

longitudinal direction of said slit opening is b, said pitches satisfy the following expression.

$$\underline{a} : \underline{b} = N : 3$$

24. The image display device according to claim 23,  
5 wherein primary color sub-pixels having the same color are arranged in a direction orthogonal to said longitudinal direction of said slit opening.

25. The image display device according to claim 23,  
wherein a set of three sub-pixels having the same relative  
10 positional relationship to a center line of said slit opening and positioned adjacent one another constitutes primary color sub-pixels with primary colors, red, blue and green.

26. The image display device according to claim 20,  
15 wherein said longitudinal direction of said slit opening of said parallax barrier is a horizontal direction of an image to be displayed.

27. The image display device according to claim 1,  
wherein said display pixel is configured so that said  
20 display pixel is to be viewed from two view points and comprises a sub-pixel for left eye and a sub-pixel for right eye, wherein an image for left eye and an image for right eye are displayed by sub-pixels for left eye and sub-pixels for right eye, respectively, and wherein at the time of  
25 display of three-dimensional image, images with parallax are displayed by said sub-pixels for left eye and said sub-pixels for right eye, and wherein at the time of display of two-dimensional image, the same images are displayed by said

sub-pixels for left eye and said sub-pixels for right eye.

28. The image display device according to claim 7, wherein said display pixel is configured so that said display pixel is to be viewed from two view points and 5 comprises a sub-pixel for left eye and a sub-pixel for right eye, wherein an image for left eye and an image for right eye are displayed by sub-pixels for left eye and sub-pixels for right eye, respectively, and wherein at the time of display of three-dimensional image, images with parallax are 10 displayed by said sub-pixels for left eye and said sub-pixels for right eye, and wherein at the time of display of two-dimensional image, the same images are displayed by said sub-pixels for left eye and said sub-pixels for right eye.

29. The image display device according to claim 8, 15 wherein said display pixel is configured so that said display pixel is to be viewed from two view points and comprises a sub-pixel for left eye and a sub-pixel for right eye, wherein an image for left eye and an image for right eye are displayed by sub-pixels for left eye and sub-pixels for right eye, respectively, and wherein at the time of 20 display of three-dimensional image, images with parallax are displayed by said sub-pixels for left eye and said sub-pixels for right eye, and wherein at the time of display of two-dimensional image, the same images are displayed by said 25 sub-pixels for left eye and said sub-pixels for right eye.

30. The image display device according to claim 9, wherein said display pixel is configured so that said display pixel is to be viewed from two view points and

comprises a sub-pixel for left eye and a sub-pixel for right eye, wherein an image for left eye and an image for right eye are displayed by sub-pixels for left eye and sub-pixels for right eye, respectively, and wherein at the time of

5 display of three-dimensional image, images with parallax are displayed by said sub-pixels for left eye and said sub-pixels for right eye, and wherein at the time of display of two-dimensional image, the same images are displayed by said sub-pixels for left eye and said sub-pixels for right eye.

10 31. The image display device according to claim 12, wherein said display pixel is configured so that said display pixel is to be viewed from two view points and comprises a sub-pixel for left eye and a sub-pixel for right eye, wherein an image for left eye and an image for right eye are displayed by sub-pixels for left eye and sub-pixels for right eye, respectively, and wherein at the time of

15 display of three-dimensional image, images with parallax are displayed by said sub-pixels for left eye and said sub-pixels for right eye, and wherein at the time of display of two-dimensional image, the same images are displayed by said sub-pixels for left eye and said sub-pixels for right eye.

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32. The image display device according to claim 1, wherein said display panel is a liquid crystal display panel.

33. The image display device according to claim 7, wherein said display panel is a liquid crystal display panel.

25 34. The image display device according to claim 8, wherein said display panel is a liquid crystal display panel.

35. The image display device according to claim 9,

wherein said display panel is a liquid crystal display panel.

36. The image display device according to claim 12, wherein said display panel is a liquid crystal display panel.

37. A portable terminal device comprising said image display device described in claim 1.

38. A portable terminal device comprising said image display device described in claim 7.

39. A portable terminal device comprising said image display device described in claim 8.

10 40. A portable terminal device comprising said image display device described in claim 9.

41. A portable terminal device comprising said image display device described in claim 12.

15 42. The portable terminal device according to claim 37, wherein said portable terminal device is a cellular phone, portable terminal, PDA, game machine, digital camera or digital video camera.

20 43. The portable terminal device according to claim 38, wherein said portable terminal device is a cellular phone, portable terminal, PDA, game machine, digital camera or digital video camera.

25 44. The portable terminal device according to claim 39, wherein said portable terminal device is a cellular phone, portable terminal, PDA, game machine, digital camera or digital video camera.

45. The portable terminal device according to claim 40, wherein said portable terminal device is a cellular phone, portable terminal, PDA, game machine, digital camera

or digital video camera.

46. The portable terminal device according to claim 41, wherein said portable terminal device is a cellular phone, portable terminal, PDA, game machine, digital camera 5 or digital video camera.

47. A display panel comprising a plurality of display pixels arranged in a matrix, each display pixel being to be viewed from N view points and including N (N represents a natural number) number of sub-pixels, wherein said display 10 panel is a monochrome display panel and when assuming a pitch of said sub-pixels arranged in one direction is a and a pitch of said sub-pixels arranged in a direction orthogonal to said one direction is b, an expression a : b = N : 1 results.

15 48. A color display panel comprising a plurality of display pixels arranged in a matrix, each display pixel being to be viewed from N view points and including  $3 \times N$  (N represents a natural number) number of three primary color sub-pixels, said display panel being further constructed 20 such that when assuming a pitch of said sub-pixels arranged in one direction is a and a pitch of said sub-pixels arranged in a direction orthogonal to said one direction is b, an expression a : b =  $3 \times N$  : 1 results.

25 49. A color display panel comprising a plurality of display pixels arranged in a matrix, each display pixel being to be viewed from N view points and including  $3 \times N$  (N represents a natural number) number of three primary color sub-pixels, said display panel being further constructed

such that when assuming a pitch of said sub-pixels arranged in one direction is a and a pitch of said sub-pixels arranged in a direction orthogonal to said one direction is b, an expression a : b =  $N : 3$  results.

5 50. The display panel according to claim 47, wherein said display panel is a liquid crystal display panel.

51. The display panel according to claim 48, wherein said display panel is a liquid crystal display panel.

10 52. The display panel according to claim 49, wherein said display panel is a liquid crystal display panel.

53. An image display method, in which at the time of display of three-dimensional image, at least  $M \times 2$  number of sub-pixels for two view points of left-eye and right eye in  $M \times N$  ( $M$  represents a natural number and 15  $N$  represents a natural number not less than 2) number of sub-pixels for  $N$  view points included in each of a plurality of display pixels arranged in a matrix to constitute a display panel, display images with parallax and a lenticular lens distributes light rays emitted from said sub-pixels for 20 two view points individually to said view points; and

at the time of display of two-dimensional image, said sub-pixels for two view points of left eye and right eye display images without parallax,

25 said  $M \times N$  number of sub-pixels included in each of said display pixels being formed within a square area.

54. An image display method, in which at the time of display of three-dimensional image, at least  $M \times 2$  number of sub-pixels for two view points of left-

eye and right eye in  $M \times N$  ( $M$  represents a natural number and  $N$  represents a natural number not less than 2) number of sub-pixels for  $N$  view points included in each of a plurality of display pixels arranged in a matrix to constitute a

5 display panel, display images with parallax and a parallax barrier distributes light rays emitted from said sub-pixels for two view points individually to said view points; and

at the time of display of two-dimensional image, said sub-pixels for two view points of left eye and right eye

10 display images without parallax,

    said  $M \times N$  number of sub-pixels included in each of said display pixels being formed within a square area.